

## **Section C - Description/Specifications/Statement of Work**

### **GENERAL SPECIFICATIONS**

#### **SUMMIT SPRINGS RANGER STATION ELECTRICAL**

**Final – 8/15/12**

##### **1.1 SCOPE OF CONTRACT**

- A. This project includes reconstruction of the electrical system at the Summit Springs Guard Station Administrative Site. Work includes installation of a hybrid generator/battery with inverter system to provide power to a Forest Service Guard Station Dwelling, Bunkhouse, Garage and Trailer Pedestals. Work also includes rewiring the dwelling and bunkhouse.

##### **1.2 PROJECT LOCATION**

- A. The project is located in the Flaming Gorge National Recreation Area of the Ashley National Forest, Daggett County, Utah, in Section 26, T 2 N, R 19 E. It is located approximately 15 miles South of Manila, UT. The project may be accessed from State Highway 44 and Forest Road 218.

##### **1.3 SITE INFORMATION AND LIMITATIONS**

- A. The following site conditions are considered incidental to the contract and the Contractor will not be paid directly for any of the following items:
  - 1. Construction sites will be closed to the public during construction. .
  - 2. Contractor will provide all materials and labor necessary to protect streams, wet or dry, during construction activities.
  - 3. All construction equipment shall be pressure washed before entering National Forest System lands. The removal of mud and debris from treads, tracks and undercarriage, with emphasis on axles, frame, cross-members, motor mounts, and underneath steps, running boards, and front bumper/brushguard assemblies will be required. The purpose is to reduce or eliminate the transportation of noxious weeds, which is required by Federal and State regulations.
  - 4. Water may be available at the site for construction purposes depending on the time of year that construction occurs. The water system is shut down based on the temperatures. No electricity is available at the site for construction purposes.
  - 5. Toilet facilities are available at the site. Until the water is shut down there are flushing toilets in the Guard Station. Once the water is shut down there is a single vault toilet onsite.

##### **1.4 WORK CAMPS, STAGING AND STORAGE AREAS**

- A. Areas for staging operations and storage of materials shall be approved by the CO. The Contractor must request in writing for approval from the CO to stage trailers (work or housing) on site.

1.5 INSPECTION OF WORKSITE

- A. The contractor acknowledges they have taken the necessary steps to ascertain the nature and location of work, and have investigated and satisfied themselves as to the general and local conditions that can affect the work or its cost. Any failure of the contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from the responsibility of estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expenses to the government.

1.6 START DATE

- A. Fall 2012

1.7 CONTRACT TIME

- A. 30 Calendar Days

1.8 SPECIFICATIONS

- A. The following specifications are attached. Some sections in the schedule of items refer to other sections not listed and are subsidiary to, or are included in payment for other pay items in this contract. These items are considered incidental and no additional compensation will be made.

Section 260500 - Common Work Results For Electrical

Section 260519 - Low-Voltage Electrical Power Conductors And Cables

Section 260526 - Grounding And Bonding For Electrical Systems

Section 260533 - Raceway And Boxes For Electrical Systems

Section 260553 - Identification For Electrical Systems

Section 262726 - Wiring Devices

END OF SECTION C

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Common electrical installation requirements.

1.2 SUBMITTALS

A. Product Data:

1. For any substitutions for equipment referred to by name.

1.3 QUALITY ASSURANCE

- A. The installation shall conform to the 2011 Edition of the National Electrical Code (NFPA 70) and to the requirements specified herein.
- B. The Contractor shall perform all work necessary and required to accomplish the task as detailed on the drawings and discussed in the installation notes. All work shall be done by a state licensed electrician.

1.4 MEASUREMENT AND PAYMENT

- A. The work in this section, including all wiring and incidentals in other electrical sections, shall be measured and paid for by the following method as shown in the Schedule of Items:
  1. Electrical System - Lump Sum including full compensation for all labor, materials, and incidentals necessary to complete the work as shown on the drawings including all wiring, ventilation, and all other incidentals necessary for a functional system.

PART 2 - PRODUCTS

2.1 PRODUCTS REFERRED TO BY NAME

- A. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or greater quality can be made by submitting a data sheet of the proposed substituted item to the Contracting Officer, for approval.

## PART 3 - EXECUTION

### 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

### 3.2 ELECTRICAL PENETRATIONS

- A. Aboveground, Exterior-Wall Penetrations: Seal exterior opening around the raceway or cable, using a flexible, waterproofing, joint sealant appropriate for size, depth, and color to closely match the surrounding surface. Finish interior openings, filling opening and matching the exiting surface with appropriate materials and finish quality for the space.

END OF SECTION 260500

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- C. Multiconductor Cable: Comply with NEMA WC 70 for nonmetallic-sheathed cable, Type NM with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders and Exposed Branch Circuits (Barn Only): Type THHN-THWN, single conductors in raceway.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Nonmetallic-sheathed cable, Type NM.
- C. Class 1 Control Circuits: Type THHN-THWN, in raceway.

### 3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Identify and color-code conductors and cables according to Specification 260553 Section "Identification for Electrical Systems."

### 3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least **6 inches (150 mm)** of slack.

### 3.4 FIELD QUALITY CONTROL

- A. Remove and replace malfunctioning or damaged units.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

## PART 3 - EXECUTION

### 3.1 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits. Where not otherwise shown in the drawings size per NEC 250.122 minimum.

### 3.2 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
  - 2. For the service grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install copper grounding conductors from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting and bond across the fitting.

END OF SECTION 260526

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. EMT: ANSI C80.3.
- B. FMC: Zinc-coated steel.
- C. Fittings for Flexible Conduit, EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Fittings for EMT: Steel or die-cast, set-screw or compression type.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
  - 1. Exposed Conduit: EMT where UL listed raintight fittings are used and the raceway is **6-inch (150-mm)** minimum above finished grade.
  - 2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
  - 1. Exposed, within barn: EMT.
  - 2. Concealed in Ceilings and Interior Walls and Partitions: Cable.
  - 3. Connection to Generator: FMC.
  - 4. Boxes and Enclosures: NEMA 250, Type 1.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Complete raceway installation before starting conductor installation.
- C. Flexible Conduit Connections: Use maximum of **72 inches (1830 mm)** of flexible conduit forequipment subject to vibration, noise transmission, or movement; and for transformers and motors.

END OF SECTION 260533

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Identification for conductors and control cable.
  - 2. Warning labels and signs.
  - 3. Instruction signs.
  - 4. Equipment identification labels.

1.2 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with 29 CFR 1910.145.

1.3 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

## 2.2 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
  - 1. Not less than **3 inches (75 mm)** wide by **4 mils (0.102 mm)** thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Printed legend shall indicate type of underground line.

## 2.3 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR **36 INCHES (915 MM)**."
  - 3. Flash Protection Warning: Minimum of "WARNING – ARC FLASH HAZARD. Battery bank capable of 15,000 a.i.c. at terminals."

## 2.4 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum **1/16 inch (1.6 mm)** thick for signs up to **20 sq. in. (129 sq. cm)** and **1/8 inch (3.2 mm)** thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.

## 2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/8 inch (10 mm)**.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be **3/8 inch (10 mm)**.

# PART 3 - EXECUTION

## 3.1 APPLICATION

- A. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number.

- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels or baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
  - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of controls.
  - 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- C. Instruction Signs:
  - 1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- D. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, and schedules.

### 3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

END OF SECTION 260553  
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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles and associated device plates.
  - 2. Wall-time-switches.

1.2 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  - 3. Leviton Mfg. Company Inc. (Leviton).
  - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour or P&S).
  - 5. Bryant Electric Incorporated, a division of Hubbell Incorporated (Bryant).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-15R, and UL 498.

1. See the Drawings for acceptable products and manufacturers. Types to be coordinated with the drawings. Submittals from manufacturers not shown of equal or better products will be considered.

## 2.3 TIMER SWITCHES

### A. Switches, 120 V, 15 A:

1. See the Drawings for acceptable products and manufacturers. Types to be coordinated with the drawings. Submittals from manufacturers not shown of equal or better products will be considered.

## 2.4 WALL PLATES

### A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.

## 2.5 FINISHES

### A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Comply with 2008 NEC 406.11 for tamper resistant receptacles in residential buildings.
- B. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- C. Conductors:
  1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
  2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtail existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
2. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
3. Connect devices to branch circuits using pigtails that are not less than **6 inches (152 mm)** in length.
4. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
5. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
6. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
7. Tighten unused terminal screws on the device.
8. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

END OF SECTION 262726

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